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distinctly claim the subject matter which applicant regards as the invention.

Claims 9, 10, 16, 20-22 have been amended in compliance with the Examiner's suggestions.

Claims 9, 10, 16, 20-22 have been further amended to address the Examiner's concern and provide statutory definiteness as required by 35 U.S.C. 112. Accordingly, it is believed that the rejection of Claims 9, 10, 16, 20-22 under 35 U.S.C. 112 has been overcome by the amendments to the Claims, and the rejection is respectfully requested to be withdrawn.

Claims 1, 2, 6, 8, 10, 15, 16, 18, 21, and 22 stand rejected under 35 U.S.C. 102(b) as being anticipated by Canada 956553 or EP 032886.

The Canada 956553 patent does not teach anything related to Applicants' invention. Rather, it teaches the conservation of acid and iron values from rinse waters of the items being pickled in a Sulfuric Acid pickling bath. Specifically, the Canada 956553 patent teaches recycling the rinse waters and concentrating the resultant diluted pickling bath by evaporating the bath with blown air. The Canada 956553 patent also mentions the procedure of recovering Ferrous Sulfate Heptahydrate from a sulfuric acid pickling bath by separate crystallization. There

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is no regeneration of Ferrous Chloride from a principally Hydrochloric Acid bath as in Applicants' invention.

The EP 0 032 886 patent uses the word "regeneration," but the word as used in EP 0 032 886 does not have the same meaning as it has in the description of Applicants' invention. The EP 0 032 886 patent teaches the "reconstitution" of either Hydrochloric Acid pickling baths or Sulfuric Acid pickling baths by the addition of, respectively, concentrated Sulfuric Acid or Hydrochloric Acid in the presence of Phosphoric Acid and then cooling and removing, respectively, Ferrous Sulfate or Ferrous Chloride. Contrary to the Examiner's comment, the EP 0 032 886 patent does not teach the adding of Sulfuric Acid to spent Hydrochloric Acid. The Examiner's attention is directed to the phase diagram. The EP 0 032 886 patent teaches that with the aid of added HCl and Phosphoric Acid, Ferrous Chloride may be recovered, not Ferrous Sulfate.

For the foregoing reasons, the rejection of Claims 1, 2, 6, 8, 10, 15, 16, 18, 21, and 22 under 35 U.S.C. 102(b) as being anticipated by Canada 956553 or EP 032886 is based on an insufficient reference and is respectfully requested to be withdrawn.

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Claim 22 stands rejected under 35 U.S.C. 102(b) as being anticipated by DE 4122920 or Morimoto 3635664 or Senior et al. 3787306.

The DE4122920 A1, as was taught in Morimoto, this patent teaches that relatively pure HCl may be distilled from a spent pickling solution containing  $\text{FeCl}_2$ . The DE4122920 A1 patent teaches that above  $500^\circ\text{C}$  under a vacuum, Ferrous Sulfate Monohydrate will form. In order to maintain the temperature below this point and obtain Ferrous Sulfate Heptahydrate, the DE4122920 A1 patent teaches that the distillation should be conducted under a vacuum so that a temperature of  $40\text{-}45^\circ\text{C}$  is maintained. In addition, a second process is the vacuum crystallization of the Ferrous Sulfate Heptahydrate in a separate vessel. These are very energy intensive and complicated processes. Applicants' invention, on the other hand, does not produce pure HCl, but rather produces the more desirable pickling solution conditioning iron ions, and thereby produces Ferrous Sulfate Heptahydrate without the use of complicated and energy intensive distillation and vacuum generation by directly generating and crystallizing the Ferrous Sulfate at a low temperature. The Examiner's attention is directed to note that the heat of vaporization is many times the heat of crystallization. Energy is required to cool

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the solution in Applicants' invention, but much is recovered by heat transfer.

The Morimoto patent discloses the regeneration of relatively pure Hydrochloric acid specifically by the use of a high energy consuming process of distillation. Applicants' process, on the other hand, works with the regeneration of Pickling Liquor. Applicants' liquor is in no way metal free. On the contrary, it contains a significant amount of dissolved iron which is desirable to have in the liquor that contacts the steel. In using virgin Hydrochloric Acid, it is preferred to add Ferrous ions to the solution before it is sent to contact the steel. Further, Applicants' process uses a very energy efficient process of crystallization rather than distillation to produce the separation of Applicants' pickling liquor from the Ferrous Sulfate Heptahydrate.

Further, Morimoto requires the production of Ferrous Sulfate Monohydrate, a distinctly different chemical compound than the Ferrous Sulfate Heptahydrate produced by Applicants' invention. It is not possible to make Ferrous Sulfate Heptahydrate by Morimoto. In summary, not only are the products of Morimoto totally different chemical entities from the chemical entities of Appli-

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cants' invention, but also the process is totally different, viz., distillation compared to crystallization.

The Senior et al. patent relates to the regeneration of relatively metal free Nitric and/or Hydrochloric Acid, specifically by the use of a high energy-consuming process of evaporation, e.g., like distillation. Applicants' process, on the other hand, requires the regeneration of Pickling Liquor. Applicants' liquor is in no way metal free which is an advantage. On the contrary, it contains a significant amount of dissolved iron which is desirable to have in the liquor that contacts the steel. In using virgin acid, it is preferred to add metal ions to the solution before it is sent to contact the metal to be pickled. Further, Applicants' process uses the very energy efficient process of crystallization rather than evaporation to produce the separation of Applicants' pickling liquor from the Ferrous Sulfate Heptahydrate.

Further, Senior et al. requires the production of "Metal Sulfate Mixtures," distinctly different chemical compounds than the Ferrous Sulfate Heptahydrate produced by Applicants' invention. It is not possible to make Ferrous Sulfate Heptahydrate by Senior et al. In summary, not only are the products Of Senior et al. totally different chemical entities different from Appli-

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cants' invention, but also the process is totally different, viz., distillation compared to crystallization.

For the foregoing reasons, the rejection of Claim 22 under 35 U.S.C. 102(b) as being anticipated by DE 4122920 or Morimoto 3635664 or Senior et al. 3787306 is based on an insufficient reference and is respectfully requested to be withdrawn.

Claims 1-10 and 15-22 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Canada 956553.

The Canada 956553 patent does not teach anything related to Applicants' invention. Rather, it teaches the conservation of acid and iron values from rinse waters of the items being pickled in a Sulfuric Acid pickling bath. Specifically, it teaches recycling the rinse waters and concentrating the resultant diluted pickling bath by evaporating the bath with blown air. It also mentions the prior procedure of recovering Ferrous Sulfate Heptahydrate from a Sulfuric Acid pickling bath by separate crystallization. There is no regeneration of Ferrous Chloride from a principally Hydrochloric Acid bath as in Applicants' invention.

For the foregoing reasons, the rejection under 35 U.S.C. 103(a) as being unpatentable over Canada 956553 is based on an insufficient reference and is respectfully requested to be withdrawn.

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Claims 1-10 and 15-22 stand rejected under 35 U.S.C. 103(a) as being unpatentable over EP 32886.

The EP 0 032 886 patent uses the word "regeneration," but the word as used in EP 0 032 886 does not have the same meaning as it has in the description of Applicants' invention. The EP 0 032 886 patent teaches the "reconstitution" of either Hydrochloric Acid pickling baths or Sulfuric Acid pickling baths by the addition of, respectively, concentrated Sulfuric Acid or Hydrochloric Acid in the presence of Phosphoric Acid and then cooling and removing, respectively, Ferrous Sulfate or Ferrous Chloride. Contrary to the Examiner's comment, the patent does not teach the adding of Sulfuric Acid to spent Hydrochloric Acid. See the phase diagram. The patent teaches that with the aid of added HCl and Phosphoric Acid, Ferrous Chloride may be recovered, not Ferrous Sulfate.

For the foregoing reasons, the rejection of Claims 1-10 and 15-22 under 35 U.S.C. 103(a) as being unpatentable over EP 32886 is based on an insufficient reference and is respectfully requested to be withdrawn.

Applicants' solicit formal approval of the formal drawings.

Attached hereto is a marked-up version of the changes made to the Claims by the current Amendment. The attached pages are

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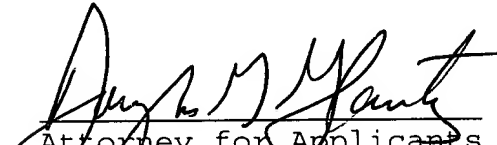
captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Reconsideration of this Application is requested.

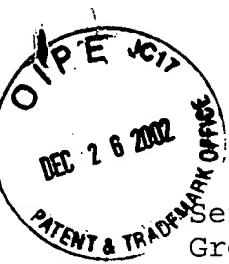
Respectfully submitted,

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

9. (Amended) A method as set forth in Claim 1, wherein said second acid is added in excess of the stoichiometric amount to react with the ferrous ions.

10. (Amended) A method as set forth in Claim 1, further comprising the step of recycling the regenerated first acid to the source of the metal pickling process acid.

16. (Amended) A method as set forth in Claim 15, further comprising the step of recycling the regenerated hydrochloric acid to the ferrous metal pickling process solution.

20. (Amended) A method as set forth in Claim 15, wherein said Sulfuric Acid is added in excess of the stoichiometric amount to react with the ferrous ions.

21. (Amended) A method of pickling a metal, comprising:

a) contacting said metal with a solution including a first acid for a time sufficient to [provide pickling] pickle the metal;

b) removing said metal from [said] resultant solution;

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c) adding a second acid to [said] resultant solution to produce a regenerated first acid and a metal salt of said second acid;

d) crystallizing said metal salt of said second acid; and

e) removing said metal salt of said second acid from [said] resultant solution.

22. (Amended) A method of regenerating the solution resulting from the pickling [a] of metal at a temperature below 50 degrees Fahrenheit (10 degrees C) capable of being crystallized by temperature reduction at a temperature below 32 degrees Fahrenheit, (0 degrees C), comprising mixing sulfuric acid with spent hydrochloric acid at a certain temperature and forming  $\text{FeSO}_4$  capable of being crystallized by temperature reduction at a specific temperature to 20 degrees Fahrenheit.